Amendments to the Claims:

This listing of claims will replace all prior version, and listings, of claims in the application:

Listing of Claims:

Claims 1 to 37. (Canceled).

38 . (New) A method of particle size and concentration measurement comprising the following steps:

providing a focused, synthesized, non-Gaussian laser beam:

causing said beam to interact with said particles;

measuring the interaction signal and number of interactions per unit time of said beam with said particles; and

using algorithms to map said interaction signals to said particle size and said number of interactions per unit time to said concentration;

wherein said focused, synthesized, non-Gaussian laser beam is a dark beam.

39. (New) A method according to claim 38, wherein the particles are one of fluid borne, airborne, and on a surface.

40. (New) A method according to claim 38, wherein the size of the particles ranges from sub-micron to thousands of microns.

41. (New) A method according to claim 38, wherein the measurements are made in the intensity domain.

42. (New) A method according to claim 38, wherein the measurements are made using the mapping of the interaction pulse width to particle size.

43. (New) A method according to claim 38, wherein the focal properties of the laser beam are changed depending on the size and concentration range of the particles.

44. (New) A method according to claim 38, wherein the non-Gaussian beam is generated by employing a mask over a Gaussian laser beam.

45. (New) A method according to claim 37, wherein the Gaussian beam is spatially modulated.

46. (New) A method according to claim 45, wherein the Gaussian beam is one of spatially modulated by use of spatial-filter, a set of spatial filters, an electronic spatial light modulator, and a liquid crystal device.

47. (New) A method according to claim 45, wherein the spatial modulation of the Gaussian beam is chosen from the group comprising:

(i) intensity modulation;

(ii) phase modulation;

(iii) wavelength modulation

(iv) polarization, modulation; and

(v) combinations of these.

48. (New) A method according to claim 45, wherein the spatial modulation is implemented statically.

49. (New) A method according to claim 45, wherein the spatial modulation is implemented dynamically

50. (New) A method according to claim 38, wherein the non-Gaussian beam is generated by one of directly modifying the laser cavity and combining the beams from several lasers.

51. (New) A method according to claim 38, wherein the interaction of the focused beam with the particles is accomplished by causing said particles to flow relative to a stationary beam.

52. (New) A method according to claim 38, wherein the interaction of the focused beam with the particles is accomplished by providing a scanning mechanism that provides a linear scanning path for said focused beam.

53. (New) A method according to claim 38, wherein the interaction of the focused beam with the particles is accomplished by providing a scanning mechanism that provides a rotary scanning path for said focus beam.

54. (New) A method according to claim 38, further comprising the use of a detection system to measure radiation scattered at 90 degrees to the beam direction one of (i) to verify single particle interaction in the focal area and (ii) as an additional dark field information.

55. (New) A method according to claim 54, wherein the detection system used to measure radiation scattered at 90 degrees to the beam direction comprises a CCD camera.

56. (New) A method according to claim 54, wherein the detection system used to measure radiation scattered at 90 degrees to the beam direction comprises several detectors.

57. (New) A method according to claim 56, wherein the several detectors are connected in a way selected from the group: addition, differential, and coincidence.

58. (New) A method according to claim 38, wherein a detection system is used to measure radiation back-scattered from the particles.

59. (New) A method according to claim 38, further comprising the use of a detector to measure radiation scattered at 90 degrees to the beam direction to detect smaller particles using dark field TOT measurement.

60. (New) A method according to claim 38, wherein high concentrations of particles are measured by using a reflection, back scatter, mode, collecting the back-scattered interaction energy from the particle.

61. (New) A method according to claim 56, wherein counting interaction signals, of the scanning laser beam, per unit time is used to measure high concentrations of particles.

62. (New) A method according to claim 38, wherein the algorithms to map the interaction signals to the particle size and the number of interactions per unit time to the concentration are explicitly based on said interaction signals.

63. (New) A method according to claim 38, wherein the algorithms to map the interaction signals to the particle size and the number of interactions per unit time to the concentration are based on an advanced artificial intelligence method.

64. (New) A method according to claim 38, wherein the advanced artificial intelligence method is a Neural Network or support vector method (SVM).

65. (New) A system for particle size and concentration measurement comprising:

one or more lasers to provide a Gaussian laser beam;

a scanning mechanism;

means for converting said Gaussian laser beam into a focused, synthesized, non-Gaussian laser beam; and

detection means;

wherein said focused, synthesized, non-Gaussian laser beam is a dark beam and said means for converting said Gaussian laser beam into said focused, synthesized, non-Gaussian laser beam are chosen from the following group:

a combination of a spatial filter and a lens; and

a liquid crystal device.

66. (New) A system according to claim 65 additionally comprising a second detection system to measure the radiation scattered at 90 degrees to the beam direction.

67. (New) A system according to claim 65, additionally comprising a beam splitter to divert back-scattered interaction energy from the particle to the detection system.

68. (New) A method according to claim 38, wherein the synthesized, non-Gaussian laser beam is circular.

69. (New) A method according to claim 38, wherein the synthesized, non-Gaussian laser beam is linear.

70. (New) A method according to claim 38, wherein the particle size is determined by differential interference of the light scattered from said particle with the two lobes of a linear synthesized, non-Gaussian laser beam.

71. (New) A method according to claim 38, wherein the particle size is determined by analyzing the polarization of the light scattered from said particle.

72. (New) A method according to claim 38, wherein two or more confocal beams are simultaneously generated, each of said beams having a different wavelength.